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PROGRESS REPORT NO. 21

TRAVELING-WAVE TUBES

Index No. 111613, Task 9
Contract N0bsr-57354
February 1954

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FEDERAL TELECOMMUNICATION LABORATORIES,
a division of International Telephone and Telegraph Corporation

500 WASHINGTON AVENUE

NUTLEY 10, NEW JERSEY

Prepared By R. H. GRIGER
Approved By J. H. BRYANT
A. K. WING, JR.

COPY NO. 5
March 1954

DEPARTMENT OF THE NAVY, BUREAU OF SHIPS
WASHINGTON, D.C.

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TRAVELING-WAVE TUBES

Driver Tube

During the past interval Tubes No. 111 through No. 115 were constructed and tested. Tube No. 111 had a power output of 456 watts with 29 db gain. At lower than synchronous voltage as much as 300 watts of oscillation power were observed. In Tube No. 112 attempts were made to eliminate this oscillation. A change in the mechanical construction of the tube was made whereby the input and output matching sections were completely isolated. This also reduced the surface area of the vacuum wall. With a reduced area of metal exposed to vacuum, the exhaust operation is improved. In Tube No. 112 a short developed in the electron gun. However, it was possible to make some limited r-f measurements. A maximum of approximately 300 watts of output power was observed with an oscillation power of less than 20 watts. This tube was rebuilt as Tube No. 114 using a new electron gun. This time 500 to 800 watts of output power were observed with an oscillation power in the order of 100 watts. It is believed that the oscillation is of the backward-wave type. Tube No. 113 was placed in a special exhaust station where it was possible to make d-c and r-f measurements during evacuation. Conclusive tests were not possible, since the loss was destroyed by an extreme amount of driver power.

Tests made on the last four tubes indicated that some modifications were necessary in the electron-gun design. It is believed that an improvement here would help eliminate the oscillation problem and increase the output power.

Output Tube

Experimental tubes Nos. 6 and 7 were completed and tested during the past month. A second Pierce-type gun has been constructed, and preparations are

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being made for exhausting and testing. Studies of slow-wave structures were continued with the demountable tube.

Program for the Next Interval

During the next interval improvement will be made in the electron-gun design of the driver tube with several tubes then being built and tested. The Pierce-type gun for the output tube will be exhausted and tested, and further mode studies of slow-wave structures will be conducted.

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